CS 101 Python Programming Assignment 1

COVID Test Result String Decoding

Introduction

In response to the emergence of the novel coronavirus, testing has become widely available with results being shared in the community to help it track and monitor the extent of the problem.

For this assignment, suppose that a sensor is recording virus test results in batches in a results string. For example,

R2+1-1

would indicate that a single batch of two tests is being reported, with one test being reported as positive for the virus and one test is reported as negative for the virus. Note that the character R is being used to start a batch of test results from this information. The character + is used to identify positive results, and the character - is used to report negative results. More than one batch of results can be reported in a single results string. For example,

R2-1+1R5+3-2

would indicate two batches of results, one with two test results and one with five test results, with a total of four positives tests and three negative tests being reported.

Precisely, to be a valid test results string,

- a batch of results must begin with the character R
- a batch of results must report both a positive and negative number of test results with + and - in either order
- no leading zeros are allowed in any numeric value being reported
- the total number of tests in a batch must equal the number of positive and negative test results
- a single result string may include multiple batches of results

All of the following are examples of valid result strings:

- R1+0-1R1-0+1 (two batches of results, two total tests being reported, one being positive, one being negative)
- R5-2+3 (one batch of results, five total tests being reported, two being negative, three being positive)

All of the following are examples of invalid result strings:

- r1+0-1 (batch must be reported with R)
- R1+-1 (a number of positive tests is required)
- R1+1- (a number of negative tests is required)

- R1+0-1 asdfR (extra characters not allowed)
- R5+00003-0002 (leading zeros not allowed)
- R5+0-0 (positive and negative results must equal the total number of tests being reported)

Your task

For this project, you will implement the following five functions, using the exact function names, parameter types, and return types shown in this specification. (The parameter and variable *names* may be different if you wish. Again the function name must be isValidString).

def isValidString(s):

return isValid

s is the covid test result string (see above examples of valid and invalid test result strings.)

isValid is a boolean variable that stores either a True or False value.

This function returns true if its parameter s is a well-formed test result string as described above, or false otherwise.

You should include an adequate level of comments in your code to help the code reviewer understand your code.

Save your Python program as CovidTestString.py. Your CovidTestString.py should include the isValidString() function and other supporting functions that you developed and called from the isValidString() function. Please remove all output statements (print()) from your functions if you used any output statements like print() to help you to test and debug.

IMPORTANT: You can only use Python built-in functions to write this program. You are not allowed to use any imported modules, packages, or libraries such as pandas, NumPy, math, etc. the goal of this assignment is to practice:

- Program design
- User-defined functions with a return value
- Global variables
- Boolean variables
- Arithmetic operators
- Assignment operators
- Comparison operators
- Logical operators
- If-elif-else control statements including nested ifs.
- While loops
- Data type casting
- String index, built-in string len() and isdigit() functions

You should be able to complete the assignment with the above-mentioned built-in Python features.

Make sure that you test your function with both valid and invalid test result strings. We will be testing your function with 30 test cases (Covid test result strings).

The grading rubric is as follows:

- The assignment is worth 100 points. Grading is based on function execution and generating correct results. You will get zero points if the function does not execute or failed all 30 test cases.
- Each test case is worth 3.3333 points (for a max score of 100).
- Your adequate comments and code readability is expected. No additional points will be given for adequate comments and code readability. However, your TF/TA will review your code and subtract up to 6 points from the overall assignment grade for the lack of adequate comments or code readability.